CLAIMS

1. A process for manufacturing a self-extinguishing cable comprising at least one transmissive element and at least one flame-retardant coating in a position radially external to said at least one transmissive element, wherein said at least one coating includes an expanded flame-retardant polymeric material comprising:

(a) at least one expandable polymer;

(b) at least one expanding agent;

(c) at least one flame-retardant inorganic filler in an amount of from 100 parts by weight to 250 parts by weight with respect to 100 parts by weight of the polymer;

the process comprising the following steps:

(i) feeding the flame-retardant polymeric material to an extruding apparatus, therein melting and mixing it;

(ii) passing the flame-retardant polymeric material obtained in step (i) through at least one static mixer;

(iii) depositing by extrusion the flame-retardant polymeric material obtained in step (ii) onto said at least one transmissive element conveyed to said extruding apparatus.

2. Process according to claim 1, wherein the at least one expandable polymer and the at least one flame-retardant inorganic filler are premixed before the step of feeding them to the extruding apparatus.

3. Process according to claim 1 or 2, wherein the at least one flame-retardant coating has electrical insulation properties.

4. Process according to claim 3, wherein the at least one flame-retardant coating is an insulation coating layer placed in a position radially external to said transmissive element.

5. Process according to claim 4, wherein the

insulation coating layer is placed in direct contact with the transmissive element.

6. Process according to claim 1, wherein the cable comprises at least two transmissive elements and a filling material which fills the interstitial zones between said at least two transmissive elements, said filling material comprising said expanded flame-retardant polymeric material.

7. Process according to any one of the preceding claims, wherein the expandable polymer is selected from the group comprising: polyolefins, copolymers of various olefins, olefin/unsaturated ester copolymers, polyesters, polyethers, polycarbonates, polysulphones, phenolic resins, ureic resins, or mixtures thereof.

8. Process according to claim 7, wherein the expandable polymer is selected from the group consisting: polyethylene (PE); polypropylene (PP); elastomeric ethylene/propylene copolymers (EPM) or ethylene/propylene/diene terpolymers (EPDM); natural rubber; butyl rubber; ethylene/vinyl ester copolymers; ethylene/acrylate copolymers; ethylene/α-olefin thermoplastic copolymers; polystyrene; acrylonitrile/butadiene/styrene (ABS) resins; halogenated polymers; polyurethane (PUR); polyamides; aromatic polyesters; copolymers or mechanical blends thereof; or mixtures thereof.

9. Process according to claim 7, wherein the expandable polymer is a polyolefinic polymer or copolymer based on ethylene and/or propylene.

10. Process according to claim 9, wherein the expandable polymer is selected from the group consisting of polyethylene; copolymers of ethylene with at least one α-olefin containing from 3 to 12 carbon atoms; polypropylene; thermoplastic copolymers of propylene with

ethylene and/or at least one α-olefin containing from 4 to 12 carbon atoms; copolymers of ethylene with at least one ester selected from alkyl acrylates, alkyl methacrylates and vinyl carboxylates, wherein the alkyl and the carboxylic groups comprised therein are linear or branched, and wherein the linear or branched alkyl group may contain from 1 to 8 carbon atoms, while the linear or branched carboxylic group may contain from 2 to 8 carbon atoms; or mixtures thereof.

11. Process according to any one of claims 1 to 6, wherein the expandable polymer is selected from the group consisting of:

(a) copolymers of ethylene with an ethylenically unsaturated ester, wherein the amount of the unsaturated ester is between 5% by weight and 50% by weight;

b) elastomeric copolymers of ethylene with at least one C_3-C_{12} α-olefin, and optionally a diene, having the following composition: 35 mol% - 90 mol% of ethylene, 10 mol% - 65 mol% of α-olefin, 0 mol% - 10 mol% of the diene;

c) copolymers of ethylene with at least one C_4-C_{12} α-olefin, and optionally a diene, having a density of between 0.86 g/cm^3 and 0.90 g/cm^3 and the following composition: 75 mol% - 97 mol% of ethylene, 3 mol% - 25 mol% of α-olefin, 0 mol% - 5 mol% of a diene;

d) polypropylene modified with ethylene/C_3-C_{12} α-olefin copolymers, wherein the weight ratio between the polypropylene and the ethylene/C_3-C_{12} α-olefin copolymer is between 50/50 and 30/70.

12. Process according to any of claims 1 to 6, wherein the expandable polymer is selected from the group consisting of a propylene homopolymer or a copolymer of propylene with at least one olefinic comonomer selected

from ethylene and an α-olefin other than propylene, having an elastic flexural modulus of between 30 and 900 MPa.

13. Process according to claim 12, wherein the propylene homopolymer or a copolymer of propylene with at least one olefinic comonomer selected from ethylene and an α-olefin other than propylene, has the following characteristics:

a melting point of from 140°C to 165°C;

a heat of fusion of from 30 J/g to 80 J/g;

a fraction which is soluble in boiling diethyl ether, in an amount of less than or equal to 12% by weight, having a heat of fusion of less than or equal to 4 J/g;

a fraction which is soluble in boiling n-heptane, in an amount of from 15% to 60% by weight, having a heat of fusion of from 10 J/g to 40 J/g; and

a fraction which is insoluble in boiling n-heptane, in an amount of from 40% to 85% by weight, having a heat of fusion of greater than or equal to 45 J/g.

14. Process according to any of the previous claims, wherein the expanding agent is selected from compounds containing at least one nitrogen atom.

15. Process according to claim 14, wherein the expanding agent is selected from the group consisting of: ammonium salts, urea, melamine, guanidine, melamine cyanurate, guanidylurea, azodicarbonamide, hydrazides such as, para-toluenesulphonylhydrazide, benzene-sulfonylhydrazide, 4,4'-oxybis(benzenesulfonylhydrazide), azobis(isobutyronitrile), dinitro pentamethylene tetramine, expandingly acceptable derivatives thereof, or mixtures thereof.

16. Process according to claim 15, wherein the expanding agent is azodicarbonamide, 4,4'-

oxybis(benzenesulfonyl-hydrazide), or mixtures thereof.

17 Process according to any one of claims 1 to 13, wherein the expanding agent is selected from mixtures of organic acid with carbonates and/or bicarbonates.

18. Process according to any of the previous claims, wherein the expanding agent is added to the flame-retardant polymeric material in an amount of from 0.01 parts by weight to 5.0 parts by weight with respect to 100 parts by weight of the expandable polymer.

19. Process according to claim 18, wherein the expanding agent is added to the flame-retardant polymeric material in an amount of from 0.1 parts by weight to 2.0 parts by weight with respect to 100 parts by weight of the expandable polymer.

20. Process according to any of the previous claims, wherein the expanding agent is compounded as a masterbatch formed by mixing the expanding agent with an olefin-based polymer.

21. Process according to claim 20, wherein the olefin-based polymer is ethylene/vinyl acetate copolymer (EVA).

22. Process according to claim 20 or 21, wherein the masterbatch comprises an amount of expanding agent of from 1% by weight to 80% by weight with respect to the total weight of the olefin-based polymer.

23. Process according to claim 22, wherein the masterbatch comprises an amount of expanding agent of from 10% by weight to 70% by weight with respect to the total weight of the olefin-based polymer.

24. Process according the any one of the previous claims, wherein the flame-retardant polymeric material comprises at least two expanding agents, said expanding agents being present in a ratio of 0.5:3.

25. Process according to claim 24, wherein said

expanding agents are present in a ratio of 1:2.

26. Process according to claim 25, wherein said expanding agents are present in a ratio of 1:1.

27. Process according to any of the previous claims, wherein the flame-retardant inorganic filler is selected from the group consisting of hydroxides, hydrated oxides, salts or hydrated salts of metals, or mixtures thereof.

28. Process according to claim 27, wherein the flame-retardant inorganic filler is selected from the group consisting of: magnesium hydroxide, alumina trihydrate, magnesium hydrated carbonate, magnesium carbonate, mixed hydrated carbonate of magnesium and calcium, mixed magnesium and calcium carbonate, or mixtures thereof.

29. Process according to claim 27 or 28, wherein the flame-retardant inorganic filler is in the form of particles which are untreated or surface-treated with saturated or unsaturated fatty acids containing from 8 to 24 carbon atoms, or metal salts thereof.

30. Process according to any one of the preceding claims, wherein the flame-retardant inorganic filler is added to the flame-retardant polymeric material in an amount of from 120 to 200 parts by weight with respect to 100 parts by weight of the expandable polymer.

31. Process according to any one of the preceding claims wherein at least one coupling agent is added to the flame-retardant polymeric material, said coupling agent being selected from short chain saturated silane compounds or silane compounds containing at least one ethylenic unsaturation; epoxides containing an ethylenic unsaturation; monocarboxylic acids or dicarboxylic acids having at least one ethylenic unsaturation, or derivatives thereof.

32. Process according to claim 31, wherein the coupling agent is pre-grafted onto a polyolefin.

33. Process according to any of the previous claims, wherein the expansion degree of the expanded flame-retardant polymeric material ranges from 2% to 100%.

34. Process according to claim 33, wherein the expansion degree of the expanded flame-retardant polymeric material ranges from 10% to 60%.

35. Process according to claim 34, wherein the expansion degree of the flame-retardant polymeric material ranges from 20% to 50%.